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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER

009629 QM32/0919
MORGAN, LEWIS & BOCKIUS
1800 M STREET NW
WASHINGTON DC 20036-5869

COMPTON, E
ART UNIT PAPER NUMBER

3726
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09/19/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/559,749

Applicant(s)
Imoehl

Examiner
Eric Compton

Art Unit
3726



-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Aug 9, 2001

2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 2-4 and 6-10 is/are pending in the application

4a) Of the above, claim(s) _____ is/are withdrawn from consideration

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 2-4 and 6-10 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirements

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11) ☒ The proposed drawing correction filed on Aug 9, 2001 is: a) ☒ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

18) ☐ Interview Summary (PTO-413) Paper No(s). _____

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

19) ☐ Notice of Informal Patent Application (PTO-152)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____

20) ☐ Other: _____

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DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 2-4 and 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over either JP 60-019957 to Yuji (JAPAN ELECTRONIC CONTROL SYST CO LTD) or GB 2 029 508 to Claxton in view of GB 2 151 516 to Sasao et al.

Yuji disclose a fuel injector valve seat having an orifice portion (14) proximate a downstream face and having a first transverse cross-sectional area, a sealing portion (13) proximate an upstream face and having a second cross-sectional area, and a transition portion (15) interposed between the orifice portion and the sealing portion.

Figures 2 and 3 show the sealing portion and the transition portion decreasing from one area to another and the conical surfaces inherently have an included angle. Furthermore, the first angle is clearly greater than the second angle.

Claxton et al disclose a fuel injector having a needle valve (107), a seat having a needle valve sealing portion (126), orifice portion (132), and a transition portion (144) interposed between the orifice portion and the needle-sealing portion.

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Figure 3 shows the sealing portion and the transition portion decreasing from one area to another and the conical surfaces inherently have an included angle. Furthermore, the first angle is clearly greater than the second angle.

The flow characteristics (i.e. fluid dynamics) of the fuel injector are based on geometrical variables (e.g. cross-sectional areas, lengths, diameters, angles, etc.). Therefore, prior to forming a fuel injector, it is inherent that these variables have been predetermined by the designer(s) to yield specific flow characteristics in the finish product. Yuji discloses that the sealing portion (13) is finally processed by grinding or lapping.

Yuji and Claxton disclose the invention cited above. Furthermore, Yuji disclose the step of grinding or lapping the sealing portion to provide a select finish. However, neither reference discloses using a grinding tool having a conical end with a vertex of the conical end disposed in the transition portion.

Sasao et al disclose a method of forming a valve seat (10a) by a burnishing operation using a rotary burnishing tool (17) to provide a select finish on the sealing portion. They also disclose that it is known to use a rotary grinding tool (f) in the prior art. Sasao et al invention uses a burnishing tool (17) rather than a grinding tool in order to "burnish[] the hollow surface to its finished size and harden[] the material at the surface of the hollow interior" (col 2, lines 105-108). The burnishing tool, nonetheless, improves the finish of the valve seat. As shown in Figure 4 the rotatory burnishing tool (17) is rotated about an axis of rotation that coincides with the axis of the fuel injector seat. Furthermore, the tool includes a conical end (17) with an apex/vertex

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(17b) of the conical end disposed in the transition portion such that the tool burnishes the seat (10') simultaneous with the guide bore (9).

Regarding claim 7, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have including a step of finishing the surface of the sealing portion in the methods of either Yuji or Claxton using a grinding tool having a conical end with a vertex, in light of the teachings of Sasao et al, so that "the finishing accuracy can be improved" (col 4, lines 87-88).

Regarding claim 6, as shown in Figure 4 of Sasao et al the grinding tool is driven in rotation about an axis.

Regarding claim 2, in both Yuji and Claxton, the first angle is clearly greater than the second angle.

Regarding claims 3-4, neither reference specifically discloses the included angles values claimed by Applicant. However, in both references the first angle appears to be in the neighborhood of 90 degrees. Furthermore, in both references the first angle is greater than the second angle. The angles affect the flow through the injector.

Similarly, neither reference specifically discloses a ratio of the first-transverse cross-sectional area over the first area. This ratio is equal to the outer (i.e. larger) diameter of the sealing portion over the diameter of the orifice portion. Again, the dimensions of the passageways affects the mass flow through the injector.

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Therefore, regarding claims 3-4, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have selected specific diameters and included angles of the fuel injector of either Yuji or Claxton, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claims 8-10, although select finishes of 0.2-0.5 micrometers are not explicitly disclosed by the references cited, Official Notice is taken that grinding to such a finish is known in the art of manufacturing valve seats.

Response to Arguments

3. Applicant's arguments filed August 14, 2001, have been fully considered but they are not persuasive.

Applicant argue that the prior art does not disclose forming an orifice portion with a first transverse cross-sectional area, forming a sealing portion with a second cross-sectional area that decreases from a first area to a second area, determining a ratio of the first transverse cross-sectional area over the first area, and forming a transition when the ratio exceeds a predetermined value, the forming includes grinding with a tool that has a conical end with a vertex of the conical end disposed in a volume provided by the transition portion.

As noted above, the Examiner cited Yuji and Claxton showing a fuel injector having the exact same structural features as claimed by Applicant. Furthermore, the Examiner relied on

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Sasao et al to showing the use of a grinding tool having a conical end with a vertex to finish the sealing seat.

Applicant further argues that Sasao et al, specifically does not teach disposing the grinding tool in a volume provided by the transition portion.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Sasao et al teach grinding the seat surface with a grinding tool in order to improve the surface finish, just as Applicant. Furthermore, the tool of Sasao et al, has a truncated cone surface rather than cone having a "sharp point." However, regardless of the shape of the apex of the cone, the vertex of either tool grinds the sealing seat. The portion that may extend into the region of the transition volume does not engage with any surface of the fuel injector and therefore, serves no precise function. A skilled artisan would be able to use either tool effectively to grind the sealing seat of the fuel injector.

Therefore, the rejections above are valid.

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Conclusion


4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

5. Official documents related to the instant application may be submitted to the Technology Center 3700 mail center by facsimile at (703) 305-3579/3580. Should Applicant desire to submit a DRAFT response to the Examiner by facsimile transmission, then Applicant should contact the Examiner at the number below for instructions concerning the transmission of DRAFT documents. Applicant is reminded to clearly mark any facsimile transmission as "DRAFT" if it is not to be considered as an official response.

6. Any inquiry concerning this communication should be directed to Examiner Eric Compton at telephone number (703) 305-0240.

ebc 
September 17, 2001


S. THOMAS HUGHES
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3700